INFLUENCE OF DIFFERENT CUTTING FREQUENCIES AND FERTILIZATION ON GRASS SILAGE QUALITY

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ABSTRACT
The influence of different cutting frequencies and fertilization on dry matter yield, botanical composition, nutrient concentration and fermentation quality of grass silage was investigated. Altogether four treatments were compared; two 5-cut-treatnents with two different fertilizer levels, one 3-cut-treatment with fertilizer and one 2-cut-treatment without fertilizer.

In the 5-cut-treatments the double fertilizer amount produced a 10% higher dry matter yield and also a higher proportion of grasses. The fermentation quality of these silages was mostly good, especially in autumn when the high nitrate content improved the quality. The 3-cut and 2-cut-variants showed a higher grass proportion, a higher crude fibre and lower crude protein and sugar contents. The quality of these silages was poor due to increases in butyric acid content. The conclusion of this study is that intensively produced fodder is easier to ensile than extensively produced fodder.

KEY WORDS
Grass silage, fermentation quality, fertilization, cutting frequency, botanical composition

INTRODUCTION
In Switzerland, grassland strongly influences the appearance of the countryside and grass is proportionally the most important source of nutrients for ruminants. In order to preserve structural diversity of the landscapes a graded cultivation intensity is necessary. This means, that some meadows should be used more or less intensively and others should be used extensively. The degree of intensification of the grassland management depends mainly on fertilization, harvest dates and cutting frequencies. In our study we investigated the influence of different cutting times and fertilization levels on dry matter yield, botanical composition, nutrient concentration of the grass and fermentation quality of the resulting silages. The fodder from the different cuts was ensiled in laboratory silos.

MATERIAL AND METHODS
On a meadow (natural grassland) which had been used rather intensively in the past, different cutting frequencies have been combined with different fertilizer amounts since spring 1993. Four treatments were realized; each plot had an area of 0.3 ha. The plots were fertilized in spring and after each cut. Besides a commercial N-fertilizer slurry was also used. The following four treatments were compared:

Treatment	Cuts per year	N-fertilizer kg per ha	slurry m^3 per ha	N-slurry kg per ha	N Total kg per ha
A	5	150	160	162	312
B	5	75	80	81	156
C	3	75	80	82	157
D	2	-	-	-	-

In 1994 and 1995, dry matter yield, botanical composition, nutrient contents and ensilability of the fodder from the different treatments and cuts were investigated.

For the silage trials the green material was pre-wilted to attain a dry matter content of approximately 30%, chopped and ensiled without additive in laboratory silos with a volume of 1.5 l. Three silos were filled per treatment and cut. The laboratory silos were stored at room temperature (approx. 20½C) and weighed regularly to measure gaseous losses. At filling, dry matter, ash, crude protein, crude fibre, sugar (water soluble carbohydrates) and nitrates were determined. After a storage period of 150 days, the silos were opened and the nutrient contents and fermentation parameters (pH, acids, ethanol and ammonia) were analysed.

RESULTS AND DISCUSSION
The average dry matter yield of the two years was 12.3 t per ha for A, 11.1 t for B, 11.2 t for C and 8.3 t for D. The botanical composition varied in both years very much from the first cut to the regrowths. In the 5-cut-variants treatment A (double amount of fertilization) showed in every cut a higher proportion of grasses and a lower proportion of clover than tratment B. The highest proportion of grasses was determined in the 2nd cut (A: 79 %; B 64%) and the lowest in the 5th cut (A: 37%; B: 36%). For the treatments C and D the proportion of grasses was still higher in comparison to A and B and reached about 85% in 1994 and nearly 90% in 1995 for the first cut. In treatment D, without fertilizer, the botanical composition did not change.

Some nutrient contents are presented for the different treatments and cuts in Figure 1. Between the two years the development of the nutrient concentrations was very similar within the same treatment. The differences between the cuts are explicable by the age of the fodder and the growth conditions during the summer.

The ash content increased from the first to the last cut, especially for the two treatments C and D. One reason for the higher ash content in autumn was the presence of voles which resulted in soil contaminations in the fodder. The crude protein and crude fibre contents were influenced by the age of the fodder and the amount of fertilizer and the proportion of grasses, respectively. The sugar content decreased in all treatments from spring to autumn, with only one exception for the last cut of 1995. Nevertheless, in all treatments the sugar content in the fresh material exceeded 1.7%, which means that the fodder was theoretically easier to ensile. Another factor influencing the ensilability is the nitrate content, which increased from spring to autumn, especially for the treatment with the highest fertilizer level.

When judged by the DLG evaluation scheme (Weissbach and Honig 1992) 85% of the silages of the two treatments A and B showed a good fermentation quality. The dry matter and silage acid contents are presented in figure 2. The higher lactic acid production in the first cut depended on the lower DM-content. A higher acetic and also propionic acid production was mainly confirmed in the fodder of the 2nd cut. These silages also showed the highest gaseous losses. The reasons for this type of fermentation is due to the higher proportion of grasses, the weather conditions and the epiphytic microflora. In spite of the increased ash content of the 5th cut, no problems of butyric acid were found in these silages. This is explicable by the efficacy of the higher nitrate content. The positive effect of the nitrate was also described by Kaiser (1994).

In 1994, all the silages of the treatments C and D showed a bad fermentation quality and in 1995 a mediocre quality. Relatively high levels of butyric acid were determined in these silages. Only the last cut of treatment C in 1995 had very little butyric acid. Thereby the higher sugar content had enhanced the lactic acid fermentation. Podkowka and Potkanski (1991) and Vogel (1996) showed also that the silage quality is influenced by the age of the fodder.

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